



The Metropolitan District
water supply • environmental services • geographic information

February 4, 2010

Mr. Paul E. Stacey,
Department of Environmental Protection
Bureau of Water Protection and Land Reuse
Planning & Standards Division
79 Elm Street
Hartford, Connecticut, 06106-5127

Re: **WRITTEN COMMENTS BY THE METROPOLITAN DISTRICT
PROPOSED STREAM FLOW STANDARDS AND REGULATIONS**

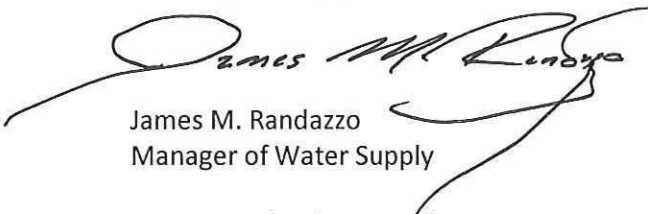
Dear Mr. Stacey:

Enclosed are Written Comments by the Metropolitan District on DEP's Proposed Stream Flow Standards and Regulations. Also included are the following attachments:

Attachments:

1. Metropolitan District Testimony on Proposed Stream Flow Standards and Regulations. January 21, 2010, as presented by William Kennedy.
2. *"Impact of Streamflow Regulations on the MDC System"*, Memorandum, Tighe & Bond, January 28, 2010.
3. *"Farmington River Basin Assessment"*, Report, Milone & MacBroom, February 2010.
4. *"Upper Farmington River Management Plan"*, April 29, 1993
5. *"Farmington Wild & Scenic River Study, Final Report"*, May 1995
6. *"An Instream Flow Study of the Mainstem and West Branch of the Farmington River"*, Normandeau Associates, June 1992
7. Special Act 444 "AN ACT INCREASING THE POWERS OF THE METROPOLITAN DISTRICT, RESPECTING WATER" 1949
8. Allied Connecticut Towns Agreement, 1949. Amendment to Agreement, 1965.
9. Contract Between the United States of America and The Metropolitan District For Water Storage Space in Colebrook River Reservoir, 1965.

Sincerely,



James M. Randazzo
Manager of Water Supply

Pc: C. Sheehan, S. Jellison, R. Moore

**WRITTEN COMMENTS BY THE METROPOLITAN DISTRICT
ON CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED STREAM FLOW STANDARDS AND REGULATIONS
SUBMITTED FEBRUARY 4, 2010**

The Metropolitan District (MDC) is a non-profit municipal corporation chartered by the Connecticut General Assembly in 1929 to provide potable water and sewerage services on a regional basis. The MDC provides drinking water to approximately 400,000 people in its eight member municipalities: Bloomfield, East Hartford, Hartford, Newington, Rocky Hill, West Hartford, Wethersfield and Windsor. The MDC also provides water service to portions of East Granby, Farmington, Glastonbury, Manchester, South Windsor, and Windsor Locks.

Among its 100,000 plus customers, the MDC provides water service to Hartford Hospital, Saint Francis Hospital, the University of Connecticut Health Center, major manufacturers such as Pratt & Whitney, Kaman and Stanadyne, and major employers such as United Technologies, Hartford Financial Group, Aetna, Travelers and CIGNA.

As a regional agency, the MDC's Charter area includes 23 municipalities located within a 20 mile radius of Hartford. The MDC has several interconnections with other neighboring water utilities and municipalities. These interconnections include the Connecticut Water Company, the Town of Portland, Berlin Water Control Commission and the City of New Britain.

With the *Stream Flow Standards and Regulations* as proposed by the Department of Environmental Protection (DEP), the MDC's ability to continue as a regional water supplier undoubtedly would be impacted. Resulting reductions in reservoir safe yield and margin of safety would lessen the MDC's ability to service its existing customer base and its ability to accommodate future needs, both within and outside its existing service area, would be severely compromised.

The MDC's primary concern with the proposed regulations is that they do not take into consideration the MDC's releases under the existing stream flow Management Plan of the Farmington River which has been in place for almost twenty years, a factor that must be taken into consideration by the DEP in its deliberations. The MDC's network of reservoirs, including the West Branch of the Farmington River, is managed as a system, and releases significantly more water to the Farmington River than the proposed regulations would require. Yet, the regulations fail to take this into account.

Description of MDC's Farmington River Reservoir System

The MDC operates four reservoirs in the Farmington River drainage basin: Nepaug, Barkhamsted, Lake McDonough, and the West Branch. Nepaug and Barkhamsted Reservoirs are the MDC's two principal drinking water sources. Lake McDonough is used primarily for recreation, and the West Branch Reservoir is used for river regulation, recreation, hydroelectric power generation and potential future

water supply. The MDC is also involved in the operation of the Colebrook River Lake along with the U.S. Army Corps of Engineers and Connecticut DEP. The MDC operates a hydroelectric power facility at Colebrook River Dam.

The MDC manages a careful river release strategy through a complex assortment of historic riparian agreements, a Corps of Engineers flood control plan, Connecticut Department of Environmental Protection (DEP) fisheries releases and the Farmington River Wild and Scenic management plan. This stream flow management of the Farmington River provides for year round recreation, fishing, fisheries habitat, and scenic value which led to the designation of the West Branch and mainstem of the river from Goodwin Dam past the confluence of the East Branch to Canton as a Wild and Scenic River by the United States Congress. The management plan maintains flow in the river well above the natural low flows and creates a unique cold water fishery while providing for hydropower, flood control, the potential for future drinking water supply and downstream waste water assimilation.

Nepaug Reservoir, constructed between 1914 and 1918, is located in the towns of Burlington, Canton, and New Hartford. This 9.5 billion gallon reservoir combines the watersheds of the Nepaug River and Phelps Brook and has a total watershed area of 31.9 square miles. The Nepaug River and Phelps Brook are impounded by the Nepaug and Phelps Brook dams respectively. Drinking water withdrawals are made from both dams and water is delivered to either of two water treatment facilities located in West Hartford and Bloomfield. In addition to providing water to the MDC service area, Nepaug also serves as a source of water for Collinsville and the City of New Britain. Through an eighty year old agreement, New Britain maintains the rights to a potential demand of 5 million gallons per day (MGD) from the reservoir which may be sought by the City should the safe yield of the New Britain reservoir supply be diminished by the proposed regulations. New Britain owns and maintains a pumping station and pipeline designed to pump Nepaug water to New Britain from the base of Phelps Brook Dam.

To compensate downstream riparian users for the loss of flow in the Farmington River caused by the construction of Nepaug Reservoir, Lake McDonough, formerly "Compensating Reservoir", was constructed in 1916 to 1919 on the East Branch of the Farmington River to provide releases to meet the riparian stream flow uses. Although still used to regulate stream flow, Lake McDonough ultimately became a recreation facility now serving between 50,000 to 70,000 visitors per year from throughout Central Connecticut for swimming, boating and fishing. MDC stocks Lake McDonough with fish for recreational users.

Barkhamsted Reservoir, constructed in 1933 to 1940, is located on the East Branch of the Farmington River, in the towns of Barkhamsted and Hartland. Barkhamsted is the largest drinking water reservoir in the state and holds over 30 billion gallons of water. The reservoir, impounded by the Sville Dam has a watershed area of 53.8 square miles. Water from Barkhamsted can be transferred to either of the MDC's two treatment facilities via gravity pipelines.

In 1949, the Connecticut legislature passed Special Act 49-444 *"An Act Increasing the Powers of the Metropolitan District Respecting Water"* authorizing the Metropolitan District to construct Goodwin Dam. The Special Act established a minimum flow release of 50 cubic feet per second (cfs) requirement for the West Branch of the Farmington River.

Goodwin Dam was constructed between 1955 and 1960, and the resulting impoundment is now known as "West Branch Reservoir". Goodwin Dam became the primary control point for regulating river releases for downstream riparian needs. West Branch Reservoir is used for recreational boating and fishing, hydroelectric power generation and is held in reserve for future water supply. The MDC's hydroelectric facility at Goodwin Dam is regulated by the Federal Energy Regulatory Commission (FERC).

From 1965 to 1969 the Corps of Engineers built the multi-purpose Colebrook River Lake within the confines of the MDC's West Branch watershed. The purpose of the reservoir was to provide storage for flood control, water supply, fisheries pools and for recreation. The MDC contributed \$5.3 million towards the cost of the project to provide an additional 10 billion gallons for water supply. In 1988, MDC constructed hydroelectric power facilities at Colebrook River Dam. This hydroelectric facility is regulated by FERC. The watershed area of Colebrook River Lake is approximately 118 square miles.

Five thousand acre-feet of storage is set aside within Colebrook River Lake for Connecticut DEP to enhance anadromous brown trout runs and five thousand acre-feet is set aside for Connecticut DEP to enhance American shad runs. Connecticut DEP is responsible for the control of these fishery management pools and the releases are coordinated through the MDC.

Management of the Farmington River System

The regulation of river flow releases primarily takes place at the MDC's Goodwin Dam and the U.S. Army Corps Colebrook River Dam. The MDC owns and operates Goodwin Dam and makes releases to the West Branch of the Farmington River in accordance with the Connecticut General Statutes, a riparian agreement, and an agreement with the Allied Connecticut Towns. The US Army Corps owns and operates the Colebrook River Dam and manages flow releases with the MDC and Connecticut DEP.

Pursuant to these obligations, required releases from Goodwin Dam occur as follows:

- Minimum release of 50 cubic feet per second (cfs) at all times;
- Additional release of all natural flows up to 150 cfs;
- Additional release of any flows released from Otis Reservoir;
- Additional riparian releases upon request by the Farmington River Power Company, up to 21.7 billion gallons per year, total;
- Pass through of fisheries releases from Connecticut DEP hold-over pools in Colebrook River Lake.

These releases are measured at a USGS gauging station located on the West Branch in Riverton.

Upper Farmington River Management Plan:

The *Upper Farmington River Management Plan*, copy attached, was prepared under the *Farmington Wild and Scenic River Study* authorized by Congress in 1986 through P.L. 99-590. The plan, issued on April 23, 1993, outlines management of a 14-mile section of the West Branch and Farmington River mainstem in Connecticut extending from immediately below the Goodwin Dam to the downstream end of the New Hartford/Canton town line.

The Study was led by the Farmington River Study Committee which included representatives from the State of Connecticut, the Metropolitan District, the Farmington River Watershed Association, the U.S. Department of the Interior and local towns along the Farmington River. The National Park Service serves as the key federal representative in the implementation of the management plan.

One of the key Goals of the Management Plan was to *"Balance the legitimate demands on the river for water supply, waste assimilation, energy production, and commercial and industrial uses, while maintaining stream flow and water quality necessary to sustain fisheries, recreation and scenic qualities at levels sufficient for wild and scenic river designation."*

The plan established the Farmington River Coordinating Committee (FRCC) to promote the long-term protection of the upper Farmington River by bringing the key stakeholders together on a regular and ongoing basis. The Metropolitan District is an active participant on the FRCC.

Instream Flow Study

An *Instream Flow Study* of the Farmington River's West Branch and mainstem was completed in 1992. The project was administered by the Connecticut Department of Environmental Protection, utilizing Normandeau Associates to conduct the study. The consultant performed hydraulic modeling to predict water yields at various points in the watershed under normal, dry and drought conditions. An Aquatic Biology Study was performed. Fish habitat was assessed using the "Instream Flow Incremental Methodology" (IFIM). The study examined the effects of different flows on the amount of habitat available for Atlantic salmon, brown trout, brook trout, American shad, smallmouth bass, and longnose dace. A recreation and aesthetics assessment was made for fishing, tubing, canoeing, play boating and scenic enjoyment.

Under a recent study, entitled "Farmington River Basin Assessment", (copy attached) Milone and MacBroom prepared flow duration curves for the Riverton, Unionville, and Tariffville gauging stations for the periods 1978-2009 and 1994-2009 to focus on the period of time following the Instream Flow Study and adoption of the Upper Farmington River Management Plan. The study concludes that "it is certain that the Farmington River benefits from a greater instream flow than it would have without management occurring in the West Branch." The study further states, "The allocation of the Nepaug and Barkhamsted Reservoirs to public water supply is entirely offset by management of the West Branch." Nepaug Reservoir includes the Nepaug River and Phelps Brook watersheds and Barkhamsted

includes the East Branch Farmington River watershed. The Barkhamsted and Nepaug Reservoirs have a total watershed area of approximately 85.7 square miles. This is only a small fraction (14%) of the Farmington River's total watershed.

The resulting flows and management of the Farmington River which developed over time with the Corps of Engineers, the Connecticut Department of Environmental Protection, the "Allied Towns", the Farmington River Power Company and other riparian users was studied thoroughly by the U.S. National Park Service to determine designation as a Wild and Scenic River. The West Branch from the toe of Goodwin Dam to Collinsville was ultimately designated by Congress. The study of the river included an "in-stream flow analysis", evaluating river conditions at all flow regimes. The current management plan provides for flood control storage, hydropower during higher flow periods, maintenance of a cold water and anadromous fisheries, and a wide variety of fishing, boating and scenic beauty, and includes the potential for a future water supply while maintaining these other uses. It also provides a minimum flow in the river well above a "natural" condition before the reservoirs were constructed. The management plan for the Wild and Scenic River Study and Instream Flow Study should be added as an additional exemption under the proposed regulation.

The MDC believes that the impact to the current management of the stream flow in the Farmington River Basin by the application of the proposed regulations will not be beneficial to the habitat and uses of the watershed; accordingly, the MDC encourages DEP to consider our request to accept the Wild and Scenic designation, in-stream flow analysis and resulting management plan as an option for a defined management plan. The increase in flows to the East Branch and Nepaug River should not be considered without a total evaluation of the full watershed impacts.

Impact of the Proposed Regulations on MDC's Safe Yield and Margin of Safety

The Connecticut Department of Public Health (DPH) approved safe yield of the Metropolitan District's Barkhamsted and Nepaug reservoir system is currently 77.1 MGD. A recent analysis by our consultant Tighe & Bond, entitled *"Impact of Streamflow Regulations on the MDC System"*, (copy attached) indicates that under the proposed regulations, assuming the streams below the MDC's drinking water reservoirs were classified as "Class 3", the safe yield of this system would be reduced by 11.4 mgd or 14%*. (*Note: In order to more closely approximate the impact of the proposed stream flow standards, Tighe & Bond calculated safe yield using a daily time-step model, resulting in a safe yield of 78.9 mgd. The DPH approved safe yield of 77.1 mgd is based on a monthly time-step.)

Under the proposed regulations, the MDC's "Margin of Safety" which is presently 31% and projected to be 25% in 2012 and 16% in 2050 would be reduced to 8% by 2012 and 1% by 2050. As a result, the MDC's margin of safety would immediately be reduced below the Connecticut Department of Public Health (DPH) recommended 15% margin of safety. Consequently, the MDC may be required to develop new sources of supply to meet its own projected needs in the 2012 to 2020 timeframe. The MDC would likely be forced to look to the West Branch of the Farmington River for these additional supplies.

Drought Contingency Impact

The higher releases required under the proposed regulations would increase the frequency under which the MDC would have to activate its Drought Contingency Plan and require its customers to restrict water usage. Where the MDC historically had an average drought frequency of once every 15 years, the drought frequency would be increased to once every 4 years. The proposed DEP drought trigger reductions may take effect after it's already too late.

Operational Impacts

Releases required by the proposed regulations would result in consistently lower reservoir levels. These lower reservoir levels could potentially cause changes in raw water quality in the reservoirs resulting in increased water treatment costs to meet health standards.

The MDC moves water from Barkhamsted and Nepaug Reservoirs to its water treatment facilities in West Hartford and Bloomfield via gravity pipelines and tunnels. One of the beauties of this transmission system is that there is no pumping involved and therefore no energy costs. MDC can deliver more than 60 million gallons per day to its treatment facilities without using any electricity or fuels. Reduced reservoir levels would reduce available hydraulic head thereby reducing the hydraulic capacity of the MDC's gravity pipelines and conduits. This could limit the MDC's ability to deliver enough water from its reservoirs to its water treatment facilities during peak flow periods. Under certain low reservoir conditions the MDC would need to rely on its drought emergency Puddletown Booster Pumping Station to artificially recreate the lost hydraulic head. Use of this pumping station would result in significant energy usage and significant electrical costs.

Impact of the Regulations on Other MDC Reservoirs

The Metropolitan District owns dams and reservoirs that are not used for drinking water and have no consumptive water withdrawals. These include Reservoir # 1 in West Hartford and Cold Brook Reservoir in Glastonbury.

Cold Brook Reservoir in Glastonbury is an abandoned former drinking water reservoir that has not been used since the 1960's. This small, 10 million gallon reservoir has a watershed area of approximately 6.3 square miles so it would not fall under the 3 square mile exemption. No consumptive water withdrawals are made from this reservoir. It is unclear from the regulations if this dam and reservoir would be exempt or subject to the proposed stream flow standards. The reservoir would seem to be exempt under the "run-of-river" exemption but the run-of-river definition is unclear. It would be unreasonable to require that costly modifications be made to a dam of this sort to comply with multi-level release requirements. Small benefit to stream flows, if any, would be achieved.

MDC also owns several small reservoirs in West Hartford. Reservoir # 1 is not used for water supply and has no consumptive withdrawals. Reservoirs #2, #3, #5 and #6 play varying roles in the MDC's water

supply system and all have very small natural drainage areas. These reservoirs are all well over one hundred years old and were constructed in the 1870's to the 1890's.

Reservoirs #5 and #6 act generally as storage facilities, accepting flows from Barkhamsted and Nepaug Reservoirs prior to treatment for distribution. These two reservoirs serve as balancing reservoirs, allowing peak period withdrawals when these flows would exceed the flow capacities of the gravity transmission pipelines. The "natural" watershed of these reservoirs is 0.3 and 2.0 square miles respectively.

Reservoirs #2 and #3 are held in reserve for emergency use only and water withdrawals are rare. The watershed areas of Reservoirs #2 and #3 are 1.1 square miles and 0.6 square miles respectively.

Reservoir #2 is upstream of and in series with Reservoir #5. Reservoir #5 is upstream of and in series with Reservoir #1. Reservoir #3 is also upstream of and in series with Reservoir #1. Water released from these reservoirs flows through what are essentially man-made channels between the reservoirs. The streams connecting these reservoirs are substantially altered from their natural state and have been so for well over one hundred years.

The MDC is of the opinion that the West Hartford Reservoirs would all be exempt under Exemption "19" because their watersheds are each less than 3 square miles. We feel it is unreasonable however to require a release of 0.1 cubic feet per square mile (cfsm) at times when natural inflows are less than 0.1 cfsm, as they would be under extended dry periods.

Financial Impacts

If the MDC were required by DPH to restore margin of safety lost due to the stream flow standards and regulations, the MDC would need to develop additional water supply sources. The two most viable options would be the development of groundwater wells or construction of infrastructure to utilize water from the West Branch of the Farmington River.

The cost to the MDC's customers is difficult to estimate at this time but it is anticipated that a groundwater source with treatment in Glastonbury would exceed \$25 million. It is anticipated that the infrastructure cost to utilize the West Branch would exceed \$150 million.

Modifications to existing dams to control and monitor stream flow releases would exceed \$10 million. There would also be increased operating expenses for reservoir operations and for the monitoring and reporting of stream flow releases.

The Metropolitan District is already facing significant capital costs to replace and rehabilitate aging infrastructure such as pipelines, pump stations and dams. Much of this existing infrastructure is greater

than or approaching 100 years of age. Costs for infrastructure related to new supplies and modifications needed to meet stream flow release standards will additionally burden our 100,000 water customers.

REGIONAL ISSUES

Interconnections with Other Utilities:

The MDC has several interconnections with other neighboring water utilities and municipalities. These interconnections include The Connecticut Water Company (Unionville, Collinsville, Windsor Locks, South Windsor), the Town of Portland, Berlin Water Control Commission and the City of New Britain. Faced with a reduction in its available water supply, the MDC would need to consider terminating or limiting current water sales agreements with neighboring communities. The MDC is not certain about the potential claims that might be made as a result of the MDC's inability to fulfill these obligations or any termination that might occur.

In addition to needing additional sources for the MDC's member communities, the MDC would no longer be able to assist in providing solutions to regional water supply problems. This is contrary to the spirit of the Connecticut Plan and the Water Utility Coordinating Committee (WUCC) process promoted by Connecticut DPH. It is anticipated that the proposed regulations would impact many of Connecticut's smaller water utilities in such a way that they would be forced to look to larger utilities such as the MDC to meet their water needs.

Economic Impact on the Region

It is anticipated that a reduction in MDC water supply would have a potentially negative economic impact on economic development in the greater Hartford area. Business development and residential growth would be substantially hampered by restricted water supply.

Recreational Impacts

Lake McDonough is presently used as a recreational reservoir with four public beaches, boating and fishing. The facilities are often used by 50,000 to 70,000 people per year. The majority of visitors and beach users are typically from Hartford (36 percent), New Britain (11 percent), and West Hartford (7 percent). The majority of visitors who fish are typically local.

Three of the beaches, East Beach, West Beach and Goose Green Beach are operated by the MDC. Another beach, Stancliff Cove is a town beach operated by the towns of Barkhamsted and New Hartford primarily for residents of these towns. The towns of Barkhamsted and New Hartford operate this beach at Stancliff Cove under the Allied Towns Agreement.

In order to meet minimum release requirements from Barkhamsted Reservoir, the MDC would have to consider the use of Lake McDonough as a storage reservoir to regulate releases from the East Branch. As a result, it is unlikely that the MDC would be able to continue its recreation program.

Comments Related to Specific Sections of the Proposed Regulations.

Sec. 26-141b-3. Applicability:

- We suggest that an additional exemption be added to the proposed regulations to include all water bodies defined within river flow management plans as part of an approved federally designated Wild and Scenic River with an approved Instream Flow Study.
- We suggest that the Exemption (19) "Operation of a dam that impounds a river or stream system with an upstream drainage area of three square miles or less..." should be modified to say "an upstream natural drainage area of three square miles or less..." Also, releases should not be required to exceed natural inflow when the inflow drops below 0.1 cubic feet per second per square mile (csfm).

Sec. 26-141b-6. Presumptive Standards.

- The existing Minimum Stream Flow Standards state in Sec. 26-141a 6. Flow Requirements. (f) *"Except for flows required by (b), no release shall be required which is in excess of the natural flow of water into the impoundment or diversion on that day."* The proposed regulations do not fairly address the situation where there is little or no natural flow coming into a system. It is unreasonable to require the dam owner to release flows greater than the natural inflow into the impoundment, especially during times of drought or extremely low inflow.

Sec. 26-141b-7 Flow Management Compacts.

- The proposed requirements for flow management compacts are unnecessarily complicated.

Please consider these comments in addition to our comments provided at DEP's January 21, 2010 public hearing.

**ATTACHMENTS TO WRITTEN COMMENTS BY THE METROPOLITAN DISTRICT
ON CONNECTICUT DEPARTMENT OF ENVIRONMENTAL PROTECTION
PROPOSED STREAM FLOW STANDARDS AND REGULATIONS
SUBMITTED FEBRUARY 4, 2010**

ATTACHMENTS:

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Metropolitan District Testimony on Proposed Stream Flow Standards and Regulations
January 21, 2010

The Metropolitan District Commission (MDC), established as a municipality in 1929 to provide water and sewer services to Hartford and certain other member towns, is affected in several significant ways by the proposed Stream Flow Standards and Regulations and I am here today to request your consideration of the issues which we will raise today and those issues which will be described in greater detail in a written submission which will follow.

As a regional agency, the MDC supplies drinking water to nearly 400,000 people in our 8 member towns as well other non member towns within our 20 mile service radius. The founders of the MDC engineered a regional water supply system that has endured a century of growth and yet remains a viable system into its second century of service.

With the regulations as proposed by the Department of Environmental Protection, the District's ability to continue as a regional water supplier undoubtedly will be impacted. You have heard and will hear concerns expressed by others regarding the impact of these proposed regulations on the water utility's "margin of safety," as determined by the State Department of Public Health. MDC echoes these concerns and notes that, given a projected reduction in our margin of safety from a current 31% to 7% in 2012, (if releases are determined under class 3) its ability to service its existing customer base and its ability to accommodate future needs will be severely compromised.

In addition, the ensuing reductions in reservoir levels to meet releases under these proposed regulations will lower the hydraulic head available and thereby reduce the capacity of the gravity transmission mains serving the treatment facilities, the subsequent lower water surface elevation would have the potential to alter the water quality due to a shallower depth of withdrawal, and drought frequency would increase from once in 15 years to once in 3 years.

The MDC's primary concern with the proposed regulation is that it does not take into consideration the MDC's releases under its existing Stream Flow Management Plan of the Farmington River which has been in place for twenty years, a factor that must be taken into consideration by the DEP in its deliberations. The MDC's network of reservoirs, including the West Branch of the Farmington River, already as a system, releases significantly more water to the Farmington River than the regulation would require. Yet, the regulation fails to take this into account.

Specifically, the proposed regulations will have an impact on the reservoirs maintained by the MDC including Reservoirs 1,2,3,5& 6, Nepaug, Barkhamsted, Lake McDonough, West Branch and Colebrook River Lake. Reservoirs 5 and 6 act generally as storage facilities accepting flow from transmission mains from Barkhamsted and Nepaug, the two supply reservoirs, prior to

defined management plan. The resulting releases from the Barkhamsted and Nepaug Reservoirs should be addressed within this management plan. This will partially allay the concerns that the MDC has with the proposed regulations.

The existing stream flow management plan also allows the MDC the ability maintain a recreational facility at Lake McDonough which, as noted above, serves between 50,000 to 70,000 visitors per year. The proposed regulations could require MDC to consider increased releases through Lake McDonough, which could eliminate the recreational swimming, boating and fishing opportunities it currently provides to residents from the greater Hartford area.

We respect the desire of the DEP to propose regulations which establish appropriate standards for both water supply and wildlife; however, these proposed regulations may not achieve the goals of all interested parties, including the MDC. Although we have presented some of our concerns in this testimony, there are others that 3 minutes worth of testimony would not do justice to. The concerns expressed by us today as well as our other concerns will be articulated in greater detail in the written testimony submitted by the deadline.

Impact of Streamflow Regulations on the MDC System

TO: William J. Kennedy, P.E., MDC

FROM: Peter B. Galant, P.E., Tighe & Bond
John N. McClellan, Ph.D, P.E., Tighe & Bond
Christina L. Stauber, Tighe & Bond

COPY: Scott Jellison, MDC
Susan Negrelli, P.E., MDC

DATE: January 28, 2010

Background

In response to Public Act 05-142 in October 2009 the Connecticut Department of Environmental Protection (DEP) proposed streamflow regulations that will set standards for releases from reservoirs and withdrawals from groundwater. A public hearing on the proposed regulations will be held on January 21 and written comments will be accepted until February 4, 2010.

The Metropolitan District Commission (the District) retained Tighe and Bond to perform an assessment of the impact of the proposed streamflow regulations on its water supplies and its ability to continue to meet its customer's needs and respond to anticipated regional needs for adequate public water supply. To perform this analysis, Tighe & Bond prepared a mass-balance model of the District's water supply reservoir system. Model scenarios were developed with and without the proposed reservoir releases. The impacts of the proposed regulation on safe yield, margin of safety, and drought frequency were evaluated based on model predictions. The purpose of this memorandum is to report preliminary results of our evaluation for the District's use in providing testimony and comments on the proposed regulations.

Model

The reservoir system model is a spreadsheet-based mass balance model that takes into account reservoir inflows and outflows and predicts changes in storage volume and reservoir levels. Assumptions for reservoir inflows (streamflow, precipitation), outflows (evaporation, withdrawals, releases) and reservoir transfer constraints and operating rules were consistent with the District's approved 1995 Revised Safe Yield Report to the extent possible. The model was also run over the 77 year period of record to estimate the impact of the proposed regulations on reservoir levels and drought frequency. Inflows to the Barkhamsted Reservoir were based on the USGS stream gage on Hubbard Brook and inflows to the Nepaug Reservoir and Reservoirs No. 5 and 6 were based on the USGS Nepaug River gage, adjusted for watershed areas. The model utilizes a one-day time interval.

The model was calibrated to actual 2002-2007 reservoir elevation data, and validated by comparing the model-predicted safe yield to safe yield values given in the District's 1995 Safe Yield Report (see Figure 1).

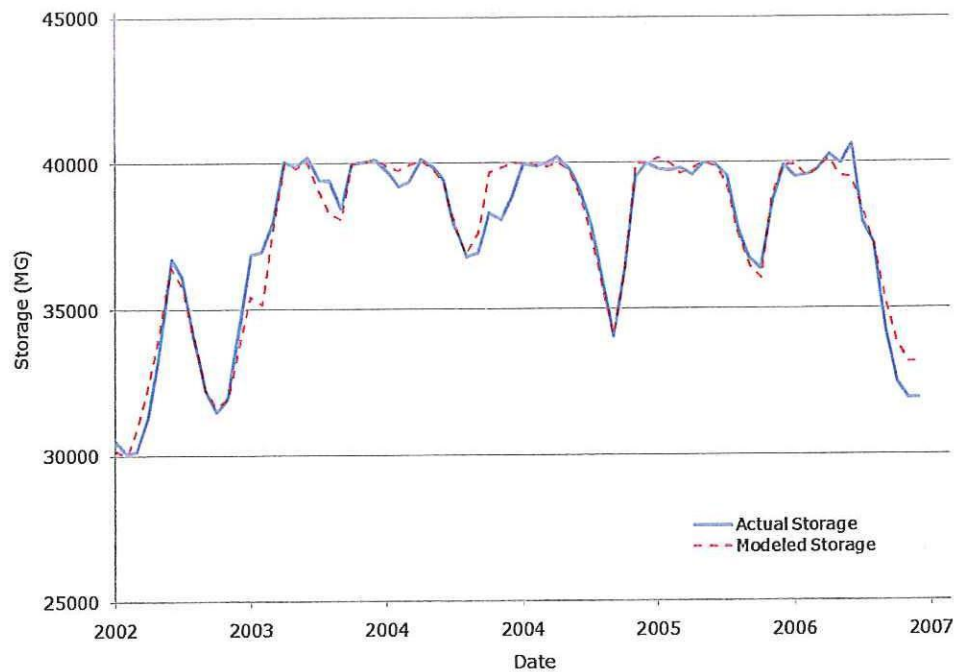


FIGURE 1
Barkhamsted and Nepaug total storage calibration

The period of record utilized in the model is October 1, 1932 to July 12, 2009. Safe yield and margin of safety were determined utilizing historical reservoir inflow data over the period of record. Drought frequency was determined assuming historical inflow data over the period of record and average system demands for each month for 2002 through 2007.

Safe yield is calculated by finding the largest demand that can be applied over the period of record without the reservoir system running out of water. As illustrated in Table 1, the 2010 model results matched the results obtained in the 1995 Safe Yield Report. Because the proposed streamflow regulations will require changes in releases on the 1st and 15th of each month, it was necessary to expand the model from a monthly to a daily time step. The 1-day interval model yielded a slightly larger safe yield than the 1995 Safe Yield Report and was used for the purpose of this impact analysis.

TABLE 1
Current Safe Yield

Source	Safe Yield (MGD)
1995 Safe Yield Report (1-month time step)	77.1
T&B Model using 1-month time step	77.1
T&B Model using 1-day time step	78.9

Impact of Proposed Releases

Model scenarios were prepared to assess the impact of the proposed releases. The following scenarios were considered:

1. Baseline case – no releases
2. Proposed releases assuming rivers downstream of impoundments are Class 3
3. Proposed releases assuming rivers downstream of impoundments are Class 4

Required stream flow releases were calculated based on stream gage data for the period of record for the Barkhamsted and Nepaug Reservoirs. The required Class 3 releases for Barkhamsted and Nepaug Reservoirs are presented in Table 2. Reservoirs 5 and 6 are less than 3 square miles in watershed size, so a constant 0.1 cfs release will be required (0.02 mgd for Reservoir 5 and 0.13 mgd for Reservoir 6).

TABLE 2
Class 3 Required Releases

Month	Bioperiod	BQ Required		Barkhamsted (mgd)		Nepaug (mgd)	
		Dry Release	Wet Release	Dry Release	Wet Release	Dry Release	Wet Release
Dec - Feb	Overwinter	BQ95	BQ75	12.6	28	6.4	14
Mar - Apr	Habitat Forming	BQ95	BQ75	28	54.2	18.7	33.3
May	Clupeid Spawning	BQ95	BQ75	15.4	31.5	11.4	21.9
June	Resident Spawning	BQ90	BQ75	6.1	10.8	6.1	8.8
July - Oct	Rearing and Growth	BQ80	BQ50	3.3	8.0	3.0	6.1
Nov	Salmonid Spawning	BQ80	BQ75	10.8	21	5.1	8.7

Table 3 presents the required reservoir release rates assuming that all downstream reaches are classified by DEP as Class 4 streams (constant release = 0.1 cfs).

TABLE 3
Class 4 Required Releases

Reservoir	Watershed (mi ²)	Release (mgd)
Barkhamsted	53.8	3.48
Nepaug	31.9	2.06
Reservoir 5	0.3	0.02
Reservoir 6	2	0.13

The Class 3 and Class 4 releases from Barkhamsted and Nepaug were decreased during periods of drought in accordance with the proposed regulation. Table 4 shows the allowed reduction in streamflow releases as reservoir storage reaches each stage of the District's approved Drought Contingency Plan.

TABLE 4
Drought Cutbacks

Drought Trigger	Stream Flow Release Requirements	
	Rearing & Growth	All other Bioperiods
Advisory	100% of Base Flow	75% of Base Flow
Watch	50% of Base Flow	50% of Base Flow
Warning	25% of Base Flow	25% of Base Flow
Emergency	no release required	no release required

Safe Yield

Safe yield and margin of safety were calculated for each scenario to assess the overall impact of the new regulations. The model-predicted impact of the proposed regulations on safe yield is presented in Table 5. As indicated in the Table, the Class 3 stream flow regulations would result in a 14% decrease in safe yield, and the Class 4 stream flow regulations would result in a 5% loss of safe yield.

TABLE 5
Impact on Safe Yield

Parameter	Assuming Class 3 Stream Releases	Assuming Class 4 Stream Releases
Baseline Safe Yield (mgd)		78.9 ¹
Revised Safe Yield (mgd)	67.5	75.2
Safe Yield Lost (mgd)	11.4	3.7
Safe Yield Lost	14%	5%

¹Calculated using daily time-step model. Approved safe yield based on monthly time-step model is 77.1 mgd

Margin of Safety

Margin of safety (MOS) is defined as the unitless ratio of available water to demand and is calculated as follows:

$$\text{MOS} = \{\text{Available Water}/\text{Demand}-1\} \times 100\%$$

In all cases available water was based on the reservoir safe yield minus the District's 5 mgd raw water commitment to New Britain and 0.65 mgd commitment to CT-Water Company's Collinsville System. The margin of safety was calculated using the baseline safe yield and the Class 3 and Class 4 safe yields, in conjunction with 2007 average system demand, and projected demands for 2012, 2020, and 2050 as presented in the District's Water Supply Plan submitted to DPH in July 2008 and pending approval. The model-predicted impact on margin of safety is presented in Table 6.

TABLE 6

Impact on Average Day Margin of Safety

Source	2007	2012	2020	2050
Water Supply Plan	31%	25%	21%	16%
Daily Time Step	34%	28%	24%	19%
Class 3 Stream Releases	13%	8%	5%	1%
Class 4 Stream Releases	27%	21%	18%	13%

As illustrated above, under current regulations the District has adequate supply to meet projected demands over the 50 year planning period. If the new streamflow regulations are finalized as proposed, and DEP classifies all of the streams below the District's dams as Class 3, the District's projected average day margin of safety will be reduced to less than 10% by 2012 and 5% by 2020. As a result, the District would likely be required to develop new supplies to meet its own needs in the 2012 to 2020 timeframe and would be restricted from providing supply to meet other regional needs until these new supplies were developed and placed in service.

Drought Frequency

In order to predict the frequency of drought restrictions which would occur under the proposed release requirements the reservoir model was run over a 77 year period for each release scenario using current (2002-2007) monthly average demands and inflows from the October 1932-July 2009 period of record. The resulting daily reservoir storage was then compared to the District's current drought triggers to determine the predicted drought frequency.

Figure 2 and 3 compare the total system storage under existing (without release) and proposed Class 3 and Class 4 release scenarios. As illustrated, reservoir storage would be consistently lower under the proposed release requirements.

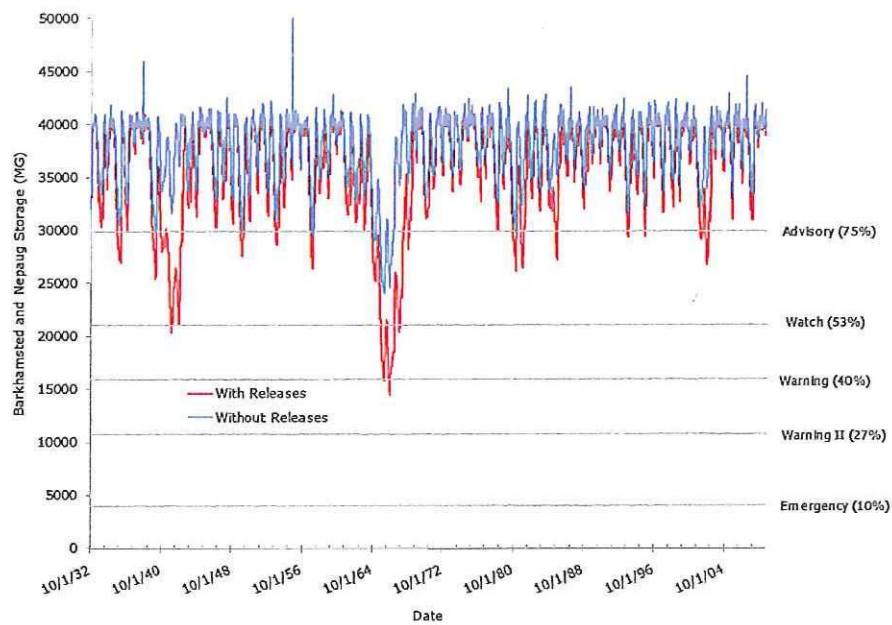


FIGURE 2
Combined Storage for Barkhamsted and Nepaug with Class 3 releases

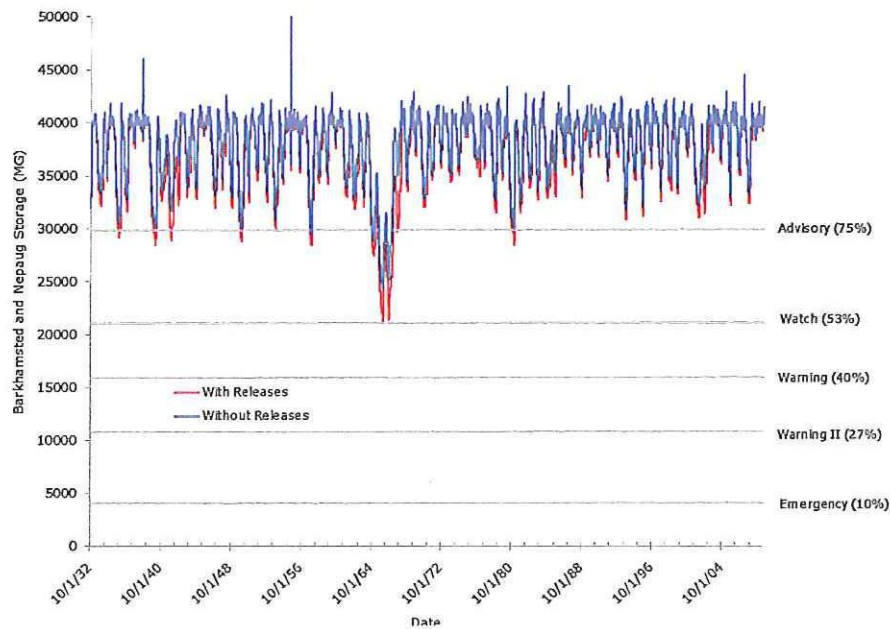


FIGURE 3
Combined Storage for Barkhamsted and Nepaug with Class 4 releases

Table 7 summarizes the impact of each release scenario on drought frequency over the 77 year period of record utilizing current demands and historical inflows. For the baseline case (no releases), the reservoir system experienced a drought advisory 5 times over the 77 year period, an average of once every 15 years. Under Class 4 releases, the reservoir entered a Drought Advisory 16 times. Under Class 3 releases, a Drought Advisory occurred 20 times in 77 years, 4 of which became a Drought Watch and 2 of which became a Drought Warning.

TABLE 7
Impact on Drought Frequency

Release	Instances of Drought 10/32 – 7/09 (77 years)				
	Advisory	Watch	Warning	Warning II	Emergency
No Releases	5	0	0	0	0
Class 4	16	0	0	0	0
Class 3	19	6	2	0	0

Summary

As indicated above the proposed streamflow regulations would reduce the District's safe yield and margin of safety and increase the frequency with which drought restrictions would be imposed upon its customers. The District's latest Water Supply Plan indicates that the system has adequate supply to meet projected demands over the 50 year planning period. If the new streamflow regulations are finalized as proposed, and DEP classifies all of the streams below the District's dams as Class 3, the District's projected average day margin of safety will be reduced to less than 10% by 2012 and 5% by 2020. As a result, the District would likely be required to develop new supplies to meet its own needs in the 2012 to 2020 timeframe and would be restricted from providing supply to meet other regional needs until these new supplies were developed and placed in service.

In addition to lower safe yield and margin of safety, the proposed regulations would result in consistently lower reservoir levels. Lower reservoir levels can potentially cause changes in raw water quality to the treatment plant and increased treatment costs and create hydraulic constraints to meeting peak demands. Higher reservoir releases will also increase the frequency with which the District will hit its drought triggers and require its customers to restrict usage. The model indicated that the average drought frequency of once every 15 years under current operating rules would increase to approximately once every 4 years if Class 3 release requirements are applied.